PROJECT FACT SHEET

CONTRACT TITLE: Geoscience/Engineering Characterization of the Interwell Environment in Carbonate Reservoirs based on Outcrop Analogs, Permian Basin, West Texas and New Mexico

ID NUMBER: DE-AC22-93BC14895

B & R CODE: AC1005000

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PROJECT SITE
CITY: Austin **STATE:** TX
CITY: Carlsbad **STATE:** NM
CITY: South Cowden Field **STATE:** TX

CONTRACTOR: University of Texas/BEG
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CONTRACT PERFORMANCE PERIOD:
09/29/1993 to 03/31/1997

PROGRAM: Supporting Research
RESEARCH AREA: Rsvr Characterization

FUNDING ($1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	720	187	907
FISCAL YR 1997	0	0	0
FUTURE FUNDS	0	0	0
TOTAL EST'D FUNDS	720	187	907

OBJECTIVE: To develop effective methods of describing the three-dimensional spatial distribution of porosity, permeability, and hydrocarbon saturations in the San Andres and Grayburg carbonate reservoirs to improve recovery of remaining mobile and residual oil from existing oil fields.

METRICS/PERFORMANCE:
Products developed: The stratigraphic concepts developed in association with this project were used to develop an improved reservoir model of a giant carbonate field resulting in reversing a 20% decline in daily production.

Research results have been used in ten other major carbonate reservoirs to justify changing waterflood and enhanced recovery programs resulting in significant reservoir additions and cost savings.

Revised reservoir descriptions based on the results of this research program resulted in deepening of 10 wells in one field.

PROJECT DESCRIPTION:

Background: The goal of this research is to develop methods for constructing better 3D descriptions of porosity, permeability, and hydrocarbon saturations in carbonate reservoirs. Previous geological and engineering studies indicate that reservoir heterogeneity is a principal cause of low recovery of oil from the carbonate reservoirs. Cost-effective methods and techniques need to adequately describe reservoir heterogeneity in order to characterize fluid flow and oil saturation remain elusive. Before improved recovery programs can be planned, descriptions of reservoir heterogeneity need to be significantly improved. This research focuses on the geological, petrophysical, and geostatistical study of outcrop reservoir analogs to understand the distribution of petrophysical properties, and the application of new understanding to subsurface analog reservoirs to develop new methods for characterizing carbonate reservoirs. A key ingredient of this study is the integration of geology, petrophysics, reservoir engineering, and geostatistics.

Work to be performed: Task are divided between outcrop and subsurface tasks. Outcrop tasks include (1) describing the sequence stratigraphic framework, (2) describing the rock-fabric facies distribution, and (3) gathering outcrop porosity and permeability data. Subsurface tasks include (1) describing the sequence stratigraphic framework, (2) relating rock-fabric facies to petrophysical properties, (3) calibrating wireline logs to rock-fabric facies and petrophysical, (4) constructing a reservoir model, and (5) conducting simulation experiments to image remaining oil saturations.

PROJECT STATUS:

Current Work: The outcrop tasks are complete and the report is being prepared. The reservoir description and performance simulation tasks are complete and the final report on the South Cowden Field is being prepared.

Scheduled Milestones:

Accomplishments: The sequence stratigraphic framework and the description of the rock-fabric facies have been completed in both the outcrop and subsurface reservoir. Porosity and permeability data have been collected in the outcrop and applied to subsurface modeling. Well logs have been calibrated with core data, and porosity, saturation, and permeability profiles calculated for 146 wells using rock-fabric specific transforms. This data has been used to quantify the stratigraphic framework. Flow simulation and scale up experiments have been completed and illustrate the need for scale up methods from core plug scale to wireline log scale. Four infill wells have been drilled and completed, all of which encountered significant volumes of undrained hydrocarbons.